# Promoting Sustainable Shorelines

## Project At a Glance

**Title:** Promoting Resilient Shorelines in an Era of Rapid Climate Change

**Place:** Hudson River Estuary, New York

**Reserve:** Hudson River NERR

**Intended Users**
- Coastal & marine engineers
- Municipal officials
- U.S. Army Corps of Engineers
- NYS Department of Environmental Conservation
- NYS Division of Coastal Resources
- NYS Office of Climate Change
- NYS Climate Action Council
- NYS Energy Research & Development Authority
- The Nature Conservancy
- Scenic Hudson, Inc.

**Project Team Partners**
New York Department of Environmental Conservation, Hudson River NERR, Hudson River Estuary Program, Consensus Building Institute, Cary Institute of Ecosystem Studies, Stevens Institute of Technology

**Timeline:** 10/2010 to 10/2013

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## Working for Sustainable Shores

In 2006, a group of New York resource managers had an "aha" moment. The vital habitats of the Hudson River Estuary were in trouble—more than they had previously imagined. Development pressure was heating up with the housing bubble. Flooding was on the rise, as were permits for "hard shore" reactions like bulkheads and riprap. Zebra mussels were stripping native life out of the water column. Projections of sea level rise were the coup de grace. They pointed to increases of up to four feet by the century's end, and in this largely rock-bound, steep-sloped estuary, there was little room for wetlands to retreat. Where the Hudson's shoreline would go—and whether it would take its vital habitats with it—depended on a regulatory environment that lacked key information.

The habitat managers knew that responding to this perfect storm of pressures would require strong collective action. A team led by the Hudson River National Estuarine Research Reserve (NERR) is building on that awareness to provide the information local stakeholders need to understand the economic and environmental tradeoffs of different approaches to managing shoreline erosion and change.

### Local Context

The Hudson River Estuary flows 152 miles from the open, rural landscapes and river towns at head of tide to the ultra urban boroughs of New York City. This project will focus on the 127-mile stretch between the Tappan Zee Bridge and the Troy Dam. There, the shoreline is regularly battered with wind-driven waves, ice scour, and the wakes of recreational boats and large commercial vessels that navigate the dredged river channel. Flooding and storm surges also occur. To combat erosion and accommodate working waterfronts, roughly 41 percent of the water's edge in this area has been reinforced with riprap, bulkhead, or cribbing. Land use decisions like these are made within an extraordinarily complex legal and regulatory framework. Along this part of the Hudson, approximately 1.3 million people live in 79 municipalities, each with its own set of land use ordinances, and each with a tradition of home rule.


Flooding along a tidal tributary of the Hudson

While these communities could adopt innovative shoreline regulations, they lack information about the economic and environmental tradeoffs of different approaches to stabilization, and any decision they make is subject to legal challenge. Fortunately, the situation is changing. Two regional action plans are calling for New York State agencies to consider sea level rise in policies related to shoreline management and coastal land use, and to provide the technical guidance needed to implement these changes.

As the state's Hudson River Habitat Protection Unit, the local NERR provides the science to support such guidance. Since 1990, its staff have worked with partners to characterize, monitor, and protect the Hudson Estuary's tidal habitats. In 2008 the Reserve and partners launched the Sustainable Shorelines Project—a multi-stakeholder initiative that uses a collaborative approach to understand and share the ecological, engineering, and economic tradeoffs among different shoreline treatments. Outcomes from this work have influenced the findings of the New York State Sea Rise Task Force.

*Fish sampling during the first phase of the Sustainable Shorelines Project.*

## Project Goal

This project team is building on the first phase of the Sustainable Shorelines Project to provide the science and guidance that Hudson River Estuary decision makers need to evaluate the environmental and economic tradeoffs of different approaches to shoreline stabilization. That guidance will be based on a new understanding of the physical forces that are reshaping local shorelines, the impacts of different types of constructed shorelines on ecological processes, and the results of a local demonstration of innovative shoreline stabilization structures.

## Approach

### Collaborative

This work builds on a collaborative framework developed during the first phase of the Sustainable Shorelines Project. The initial team adapted the Joint Fact Finding approach to establish and link three groups of people whose knowledge, experience, and institutional affiliation will be key to the project's success. Project support and expert facilitation is provided by the Consensus Building Institute.

A small Coordinating Team communicates frequently to guide project direction and work. A Project Team consisting of investigators, intended users of the science, and researchers working on related projects, will meets twice yearly to test ideas, shape interdisciplinary work, and review the project's progress. Both groups connect twice a year with a larger community of intended users through the Advisory Committee, an annual forum that includes engineers, planners, local officials, regulators, land managers, climate change policy leaders, and industry representatives who will provide their insights into how to make the project research and results most helpful on the ground.

The team's integration leads augment the work of these groups by coordinating "peer and user review" meetings that allow for simultaneous technical and intended user reviews that can influence the research methodology, products, and communications. They will also convene focus groups to gain feedback from people with key insights.

### Ecology & Engineering

This project has four primary objectives:

Evaluate how different shoreline structures affect ecological services in different Hudson River Estuary habitats. The work will focus on aspects of structures that can be manipulated, such as the roughness of the substrate used, and the vegetative cover.

Increase understanding of how physical forces are reshaping shorelines through the evaluation of numerical modeling, and physical data on wakes and ice formation. This will be used to develop guidance for regulators and design engineers who lack locally-tested science that considers the impact of physical forces on soft shoreline stabilization approaches.

Design and demonstrate an innovative shoreline demonstration site that incorporates alternative shoreline treatments using stakeholder input from the first phase of the Sustainable Shorelines Project and data from the analyses of physical forces and impact of shoreline structures on ecological services.

Integrate project results into a decision support tool that allows shoreline managers to consider which options are the best given Hudson River Estuary energy regimes, ecosystem services, and sea level rise projections.


### SUPPORT FOR THIS PROJECT

This project was funded by the NERRS Science Collaborative.


The Science Collaborative uses a competitive process to identify and fund science to address environmental challenges in communities served by Reserves. Projects are selected through annual competitions, designed to insure that investigators, intended users of the science, and relevant stakeholders work together to describe science needs to address specific problems, define research questions, design and implement projects, and apply the results.

The program works with outreach specialists, trainers, and communicators to share information about the science that it funds with other Reserves and the broader coastal management community.

The Science Collaborative also sponsors Training for the Integration of Decision-Making and Ecosystem Science (TIDES), a UNH-based program that helps develop the skills needed to link science-based information to coastal resource management decisions. TIDES offers a non-thesis master's degree track and is developing a professional certification program.

The NERRS Science Collaborative is administered by the University of New Hampshire (UNH)through a cooperative agreement with the National Oceanic and Atmospheric Administration (NOAA).


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